

UBC REPORTS



THE SUSTAINABILITY ISSUE

With hundreds of UBC students, faculty researchers, staff and alumni engaged in issues surrounding sustainability, more than 300 academic courses directly related to the subject, and a *Trek 2010* strategic plan commitment, *UBC Reports* has decided to focus an entire issue on sustainability.

Look inside for a number of articles by our international experts on the global challenges in air, water, food and energy systems. At the same time, read how your UBC community is acting locally to make a difference.

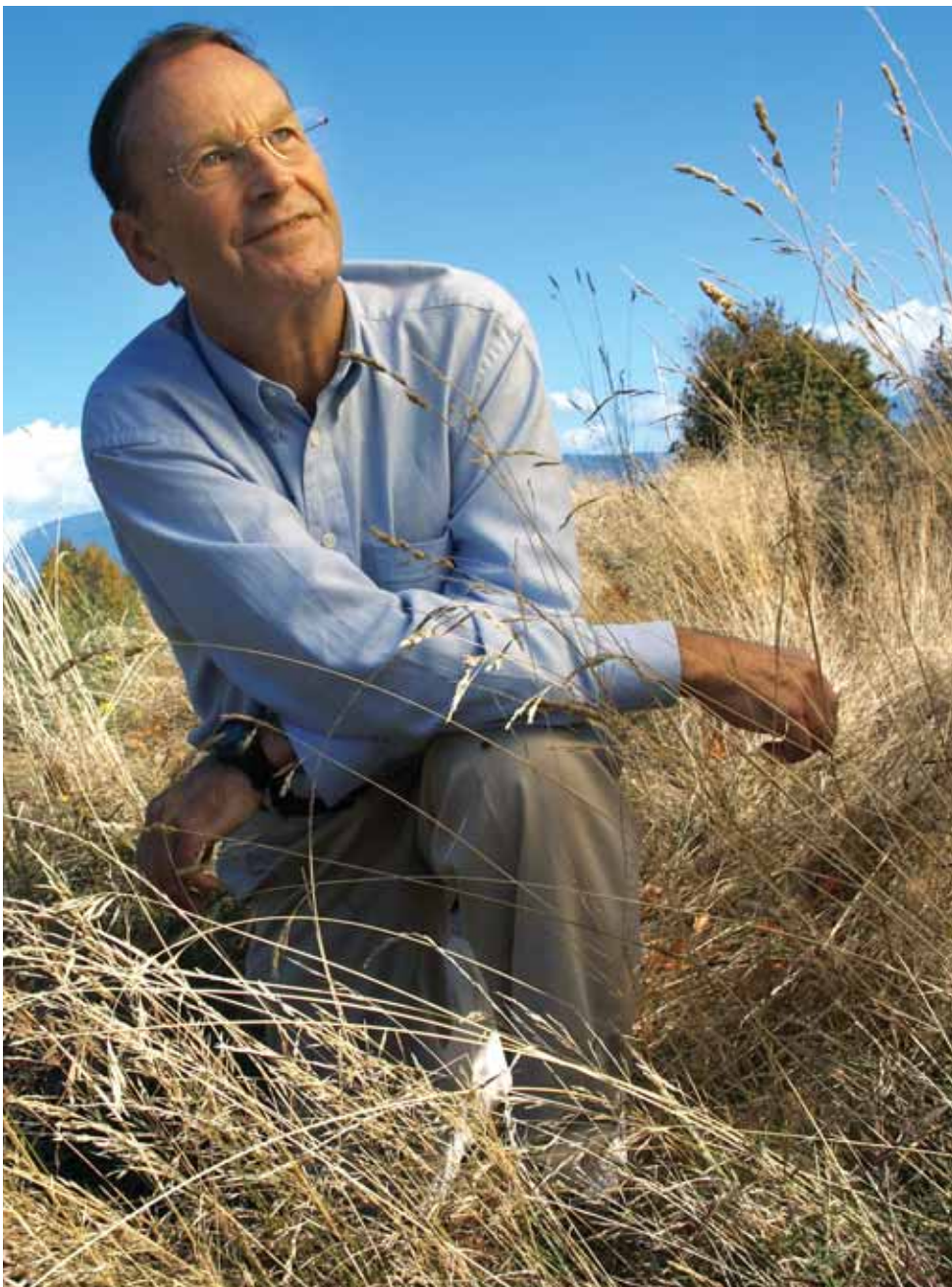


PHOTO: PERRY ZAVITS / KLIXPIX

Footprints to Sustainability

BY WILLIAM E. REES *Professor, School of Community and Regional Planning*

Almost everyone knows Pogo 'Possum's famous utterance from Earth Day, 1970. On contemplating the desecration of his beloved Okefenokee Swamp, Walt Kelly's memorable cartoon-strip character sadly observed: "We have met the enemy and he is us."

Well, 36 years later, the rest of us are just catching up with Pogo in appreciating the meaning of ecological degradation. It is finally penetrating our consciousness that climate change, tropical deforestation, desertification, the ozone hole, fisheries collapses — the whole litany of so-called environmental problems — aren't really "environmental" problems at all. They are actually the raw symptoms of human ecological dysfunction. We have indeed met the enemy and he is us.

One way of determining how great an enemy we are, is through ecological footprint analysis (EFA). I began developing this method over two decades ago after finding myself embroiled in a debate with an economist colleague over the relevance of ecological carrying capacity to humans. He argued the conventional wisdom of the day, that the combination of trade and human technological ingenuity enables modern humans to squeeze so much out of the earth that the term "human carrying capacity" is now meaningless.

Lawrence Summers, then Chief Economist of World Bank, put it this way in 1991: "There are no... limits to the carrying capacity of the earth that are likely to bind any time in the foreseeable future. There isn't a risk of an

apocalypse due to global warming or anything else. The idea that we should put limits on growth because of some natural limit, is a profound error and one that, were it ever to prove influential, would have staggering social costs."

Back then, such assertions were made with intimidating assurance and conviction, but to my ecologist's ears something was missing from the implied cornucopian vision. In part, the problem lay with the standard definition of carrying capacity. To ecologists and game managers, carrying capacity is the maximum population of a given species that can occupy a particular habitat without impairing its long-term productivity. However, if humans are the species, and trade and technology augment local productivity, well... maybe the economists have a point.

But what happens if we invert the carrying capacity ratio? Rather than asking what population a given area can support, let's ask how much area is needed to support a given population, *wherever the area is or however technologically sophisticated the population*. This shift in perspective merely acknowledges that trade and technology don't actually decouple economies from nature, they merely shuffle resources around and increase the intensity of resource exploitation. It thus re-establishes humans' direct connection to the land and puts global carrying capacity firmly back on the sustainability agenda.

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Prof. Rees is well-known for inventing the "ecological footprint analysis," a quantitative tool that estimates humanity's ecological impact.

UBC a Test Site on Hydrogen Highway

\$10-million proposal would see hydrogen run campus vehicles, cell phones

BY HILARY THOMSON

It can power a massive submarine or a 10-speed bike light, and the power source can be derived from pig manure.

This versatile device is a hydrogen fuel cell, powered by the most abundant element on earth and key to technologies that UBC plans to demonstrate as part of the BC Hydrogen Highway™ project.

The university is an integral part of the BC Hydrogen Highway™, a co-ordinated, large-scale demon-

stration program, created to accelerate the commercialization of hydrogen and fuel cell technologies. The National Research Council's (NRC) Institute for Fuel Cell Innovation at UBC Vancouver's south campus is also a member.

Announced by the Federal Government in 2004, the program's network of test sites, or highway, includes Victoria, Surrey, North Vancouver, and Vancouver Airport to Whistler, with full implementation

in time for the 2010 Winter Olympics. A consortium of organizations have come together to design, build, test and evaluate hydrogen fuel cell applications that include transportation, stationary, portable and micropower uses of the technology.

UBC's Campus Sustainability Office (CSO) has proposed a \$10-million suite of projects — approved in principal by Industry *continued on page 7*



PHOTO: DARIN DUECK

Jorge Marques displays one of the hydrogen fuels cells to be demonstrated in a campus sustainable energy technology showcase.



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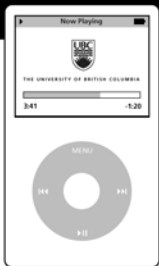
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IN THE NEWS

Highlights of UBC Media Coverage in March 2006. COMPILED BY BASIL WAUGH

Everything but the Kitchen Sink: UBC Geologists Experiment with Household Items

The *New York Times* reports on UBC geologists **Alison Rust** and **Mark Jellinek**, who use everyday items such as chocolate fudge and liqueurs to demonstrate geological concepts.

"Lava would be pretty impractical to take into the classroom," said Rust, a postdoctoral fellow. "These household items are cheap, non-toxic and I don't have to worry about spills."

In an experiment called, 'The Earth: Kinda Like a Mai Tai?' Jellinek pours various liqueurs into plastic cups to demonstrate how the composition of different geological affects their motions.



UBC geneticist Patricia Baird says that ads to sell human eggs should be illegal.

The Human Genome Project, Hollywood-Style

If you're trying to impress the nuances of genetics research upon an unknowing public, featuring half-naked, singing deliverymen who shimmy their way up DNA-shaped 'ladders of love' might not be the most obvious way to go, reports the U.K.'s *The Scientist*. But that's what you get in *The Score*, a stylized laboratory drama that switches at will between goofiness and artful poignancy.

The play-turned-film was the brainchild of UBC medical geneticist **Michael Hayden**, who commissioned the work, based loosely on his own lab, after the near completion of the Human Genome Project motivated him to communicate with the public about the project's implications.

"The creative process in its purest form is exactly the same in great art and great science," says Hayden. In its attempt to prove this, the film pieces together a caricatured portrait of a lab and its tangled web while managing to check off a number of major themes: big versus small science, science versus religion, the lure of selling out.

UN Peacekeeping Mission in Sudan 'Near the Point of Overstretch'

The Economist cites UBC Prof. **Andrew Mack's Human Security Report**, which estimated that while the number of armed conflicts around the world had dipped sharply since the early 1990s due to UN peacekeeping efforts, more people are being killed in African wars than in all the rest of the world.

The article reports that as the insurgency in Sudan's Darfur region spills over into Chad, efforts to strengthen the beleaguered African Union force in the region, by turning it into a 14,000-person fully-fledged UN blue-helmet mission with a robust mandate, take on new urgency.

The editor of a review of global peacekeeping by New York University's Centre on International Co-operation (CIC) argues that without more support for the UN, a new mission in Darfur could push peacekeeping efforts "past the point of overstretch," and calls for "strategic reserves" to be developed, so that troops can be sent more quickly to

trouble spots and missions under strain can be reinforced faster.

Online Black Market: Human Eggs for Sale

A *Canadian Press* story, picked up by several Canadian dailies, including the *Montreal Gazette*, *Hamilton Spectator*, and the *Halifax Daily News*, looks at how almost two years after the federal government passed a law banning the sale of human eggs, women are still advertising their ova for sale on the Internet — and Health Canada has no problem with it.

"I'm very surprised," said UBC geneticist **Patricia Baird**, who headed the 1993 Royal Commission on New Reproductive Technologies. "Clearly, if it's illegal to sell eggs, it should be illegal to advertise selling them. The potential for exploitation of women who need money to sell their eggs is enormous."

Egg harvesting is an invasive, medically risky procedure that requires donor women to take powerful hormones, usually by injections that first stimulate, then suppress, the ovaries. □

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Co-op Sprouts Planet-Friendly Foods

BY BASIL WAUGH



Can't tell
your eco-footprint
from a one-tonne chal-

lenge? Don't know a "Frankenfood" from a monocrop? Sprouts, Canada's largest student-run food co-op, intends to change all that.

Located in the basement of UBC's Student Union Building (SUB), the not-for-profit grocery store and education centre serves up not only information on hot-button issues related to our food, but also affordable, organically grown local and fair trade foods.

Elana Cossever is president of the UBC Food Co-op, the student club that has operated Sprouts since it opened in September 2004. With over 1,000 voluntary members, it is the largest student-run food co-op of only a handful in Canada and the only co-operative campus retailer in B.C.

"People come to our store not only to buy all these amazingly tasty organic, local and fair trade foods, but also to learn about the ecological, economic, and social benefits of eating these types of foods," says Cossever, a Master's candidate in the School of Community and Regional Planning.

"There is so much research going on at UBC into sustainable eating practices — our store gives people the opportunity to put the research into practice."

In Sprouts' small, brightly-painted location, shoppers will find artisan cheeses and breads, fresh fruit and produce, wraps, frozen soups, coffees and teas, bulk foods, snacks, condiments and vitamins. The store also sells biodegradable cleaning supplies and personal hygiene products.

Hayes Zirnelt, a first-year engineering student who lives on campus, says that convenience is only one reason why he shops at Sprouts.

"Because it's in the SUB, it means I don't have to go off-campus when I want to stock up on things — and if I'm in a hurry, I can just pop in for a banana or a wrap between classes," he says. "But mostly I come here because I believe in eating organic foods — I think it just tastes better, and I want to know that I'm not eating pesticides or anything."

While the co-op's motto is "people- and planet-friendly foods," it could easily also be "act locally, think globally," says Cossever. "Because 90 per cent of the energy that goes into industrial food production is from environmentally harmful fossil fuels — much of it from transportation — we are constantly looking for organic suppliers closer to home."

"We purchase items that can't be produced locally — bananas, chocolate, coffee and teas — through fair trade networks, which work with growers that protect human rights, environmental standards and pay better than the often exploitative commodity markets," says Cossever.



In addition to information on hot-button environmental issues, Sprouts serves up affordable, organically grown local and fair trade foods.

PHOTO: DARIN DUECK

"Because 90 per cent of the energy that goes into industrial food production is from environmentally harmful fossil fuels — much of it from transportation — we are constantly looking for organic suppliers closer to home."

In addition to the co-op's commitment to social issues around the globe, it has also partnered with social enterprises closer to home. Through the federal Katimavik program, young Quebecois aged 17 to 21 come to work at Sprouts for three-month terms to gain English-speaking work experience in a socially responsible work environment. The store also purchases all its soups, wraps, breads, and baked goods from Vancouver's Downtown Eastside Studio Café, which offers at-risk youth and adults training as chefs. Sprouts offers information on fair trade, eating local and other food-related issues through a series of outreach initiatives, including a Sprouts cookbook, a lending library, e-mail newsletters, cooking demonstrations at student residences and other special events. The co-op recently arranged for Guatemalan coffee farmers to come to UBC to speak first-hand on how fair trade networks ameliorate their livelihoods. As part of March's Ethical Consumption Week, Sprouts presented "The Future of Food," a film by Deborah Coons Garcia (widow of musician Jerry Garcia) on genetically modified food at the UBC Norm Theatre.

Before moving into its current location, the co-op's membership consisted of less than 100 students operating out of a portable behind the Faculty of Land and Food Systems' MacMillan building. But when the group launched a weekly

open-air market in the SUB, membership swelled to 400. On the basis of these numbers, the AMS offered the co-op a permanent location.

In addition to the exposure that comes with being located in the campus' busiest building, Cossever cites the efforts of researchers such as Bill Rees and Alejandro Rojas and the operational initiatives of the Campus Sustainability Office for Sprouts' growth. "Because of the work being done on sustainability, students, staff, and faculty have really embraced the store when they find out about it," says Cossever.

A large part of Sprouts' success is due to its seven-person executive's ability to complement the store's revenues with addition sources of income including, from UBC's AMS, a \$20,000 donation of in-kind renovations and a \$3,000

Innovative Project Fund grant. The student government continues to offer its space rent-free in recognition of the co-op's club status. In 2004, then AMS Vice President Academic Lyle McMahon, who spearheaded the AMS Ethical and Sustainable Purchasing Policy, donated \$2,000 of his salary to the store's operation.

Cossever says that this financial support allows the co-op to keep prices as low as possible, which is another reason for Sprout's continued growth in membership. "Because organic farmers don't have the economics of scale of conventional food producers, the biggest argument against eating organically is that it is more expensive than non-organic foods," says Cossever. "We feel that students should be able to afford to buy fair trade and organic foods — and

because of our not-for-profit model, we can sell these foods for less than you will find anywhere else."

Sprouts' ecological and social efforts are attracting international attention. The U.S. Kellogg Foundation, established in 1930 by cereal pioneer W.K. Kellogg to promote sustainable food systems, has lauded the store and invited then co-op president Alice Miro to attend its 2005 policy conference. Last year, Canada's Sierra Youth Coalition featured Sprouts as part of its National Sustainable Campus Conference, and later this year, the store will be profiled in a magazine published by The Food Project, a Boston-based non-governmental organization.

Sprouts is open Mon-Fri, 9:30 a.m. — 6 p.m. from September to the end of classes in April. For more information visit, www.ams.ubc.ca/clubs/nfs. □

Want to Make a Difference? Have a Brownie

Sprouts' huge organic brownies incorporate all the facets of sustainability — ecological, economic, and social. Available for \$1.75, they are made from scratch by at-risk youth and adults at Vancouver's Downtown Eastside Cook Studio Café using fair trade cocoa and cane sugar, free range eggs, and local dairy and milled flour. UBC Food Co-op president Elana Cossever calls the brownie the store's "little

sustainability mascot."

"It's still super rich, but I think we've made it as 'guilt-free' as a chocolate brownie is going to get." □



A Peek Past Peak Oil

BY HADI DOWLATABADI, Professor, Canada Research Chair in Applied Mathematics and Global Change, Institute for Resources, Environment & Sustainability



PHOTO: DARIN DUECK

The world's production of oil has peaked and is on its way down, meanwhile the awakening of new economies like China and India has deepened the thirst for the stuff. This is popularly referred to as the Peak Oil crisis. Many have interpreted this as the death knell to fossil fuels and the dawn of a new era of energy conservation and alternative energy. Unfortunately, those who have pinned their hopes for such changes on high oil prices will be disappointed to learn that we are simply at another energy crossroads. Beyond conservation and renewable resources, there are plenty of fossil fuels yet to exploit. And the nuclear industry, in phoenix-like resurrection from the glowing ashes of Chernobyl, is also in the running as our savior.

History has seen humanity cope with many past Peak Oil equivalents. In the fourteenth century, the UK had their "Peak Wood" crisis. Wood demand had changed the landscape, destroyed ecosystems, and the shortage promised disruption of society. However, the rising price of wood led to the emergence of coal as the new fuel of choice and even greater energy use. At the turn of the twentieth century, whale oil was the lighting fuel of choice. With the demise of large whales the price of fuel for lighting rose tenfold to over one hundred dollars per barrel and the era of petroleum was born. In the 1920s, Henry Ford was building his cars to run on renewable fuels (ethanol). Agricultural productivity could not keep up with demand when yields were poor, the price of ethanol rose with each draught and blight, this opened the door to petroleum products to capture the motorized transportation market.

Today, we are at a crossroads again. Our options include: renewables, nuclear, non-conventional oils and coal. Unfortunately, none of these options are free from vice. Hydro dams are by far the most established renewable energy resource. However, even the existing

dams are opposed by environmentalists on the basis of their ecological impacts. Wind is the next most competitive option in the marketplace. However, in generating power from the flow of energy in the atmosphere, wind turbines change the climate too. The nuclear option scares the public because of fuel processing and radioactive wastes that will be with us for thousands of years. They are also of concern because security around nuclear infrastructure is socially oppressive.

Renewable alternatives such as biodiesel and ethanol are being ramped up rapidly, but at most can contribute 20 per cent of our liquid fuel needs before 2020. The "smart money" is on infrastructure to convert coal and tar sands into liquid fuels. These options will have the upper hand because their fuel is most compatible with our existing infrastructure. This rush to fill the shortfall will lead to over-capacity. There will be a glut in the liquid fuels market, and the price of "oil and its equivalents" will not rise beyond \$100 per barrel as predicted, but fall towards the marginal cost of production from tar sands and coal at between 20 to 40 dollars per barrel. This will not be conducive to energy conservation in the long run. And while we can be chastised for being profligate, we cannot deny the rest of the world the needs that only greater energy consumption can fulfill.

There is a silver lining to this seemingly gloomy tale. As recently as five years ago, the spectre of oil at \$60 per barrel would send politicians scurrying. Environmentalists urging for pollution controls and carbon mitigation to prevent further climate change were dismissed for their unacceptable cost. Since we have now lived through oil at these high prices without economic and social crises, the environmentalists can now remind politicians that their fears were groundless and that we as a society can afford to meet our seemingly unquenchable thirst for energy while dramatically reducing its harmful effects on the environment. □

High oil prices will not lead to the end of fossil fuel use as some hope, says Prof. Dowlatabadi.

How Water Works in a Valley

Anthropologist examines the political ecology of water in the Okanagan

BY BUD MORTENSON

When there's only so much water to go around, who gets it and why?

It's the kind of question UBC Okanagan anthropology professor John Wagner hopes to answer as he embarks on an exploration of how water has been used by Aboriginal peoples, European settlers, agricultural irrigation districts and communities in B.C.'s Okanagan Valley.

"I'll be looking at the history of irrigation systems, water rights, and the policies that have been developed to manage water in the valley," says Wagner, who lived in the Okanagan in the 1970s and returned three years ago after doing doctoral research in a coastal community in Papua New Guinea and working for two years on a sustainable fisheries research project in Nova Scotia.

Wagner's project, entitled *From Abundance to Scarcity: the Political Ecology of Water Use in the Okanagan Valley*, has received \$85,864 in funding from the Social Sciences and Humanities Research Council. The project is slated to run three years — but he has a longer view. "I'm going to spend the rest of my professional life working on these issues in the Okanagan," he says.



PHOTO: BUD MORTENSON

John Wagner is studying how water, a scarce resource in one of Canada's most arid regions, is distributed and used in B.C.'s Okanagan Valley.

Drenched in 2,000 hours of sunshine a year, the Okanagan is a land of contrasts: the width of a wire fence can separate irrigated leafy orchards and vineyards from native grasslands spiked with cactus and sumac. Lakes reach from north to south, and lush green corridors along creeks and streams — known as riparian areas — punctuate the landscape. Yet for all its prominence water is by no means abundant here. This fragile environment is home to one of Canada's most arid climates.

"Over recent decades, rapid development and urbanization have resulted in habitat fragmentation and loss of biodiversity with the Okanagan now being classified as one of the most endangered habitats in the country," says Wagner. "Riparian environments and wetlands are among the types of habitat most under siege as a result of past and current water and land management strategies. You couldn't

have all the agriculture in this valley without water, and we've been pretty good at redistributing water."

But that redistribution of water raises complex issues that go back to early European settlement of the region, when government began allocating water rights.

"Water allocation practices have important social outcomes as well as ecological and economic outcomes," he says. "Water equity is an issue to look at. The people who were getting the water rights at that time were the people who were going to develop the region. It was not the Aboriginal people." In the Penticton area, for example, indigenous agricultural activity was well established and thriving by the end of the 1800s. Then, as water rights were granted to newly arriving farming interests in the early part of the 1900s, less and less was available for Aboriginal pastures and other agriculture.

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The Faculty of Medicine, University of British Columbia together with the Vancouver Coastal Health Authority (VCHA) and the Provincial Health Services Authority (PHSA), invite applications and nominations for the position of Head of the Department of Psychiatry at the anticipated rank of Professor.

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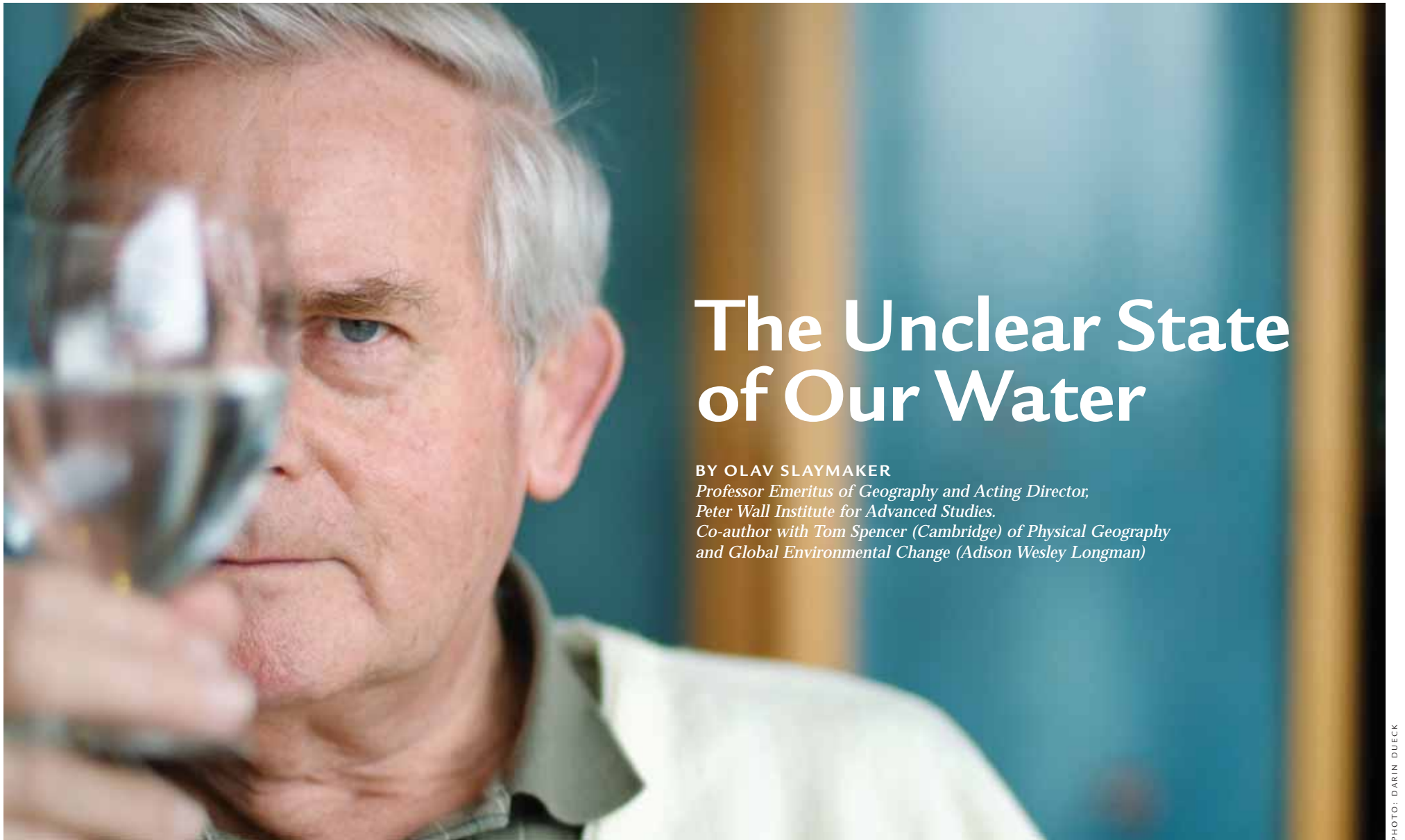
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The Unclear State of Our Water

BY OLAV SLAYMAKER

Professor Emeritus of Geography and Acting Director, Peter Wall Institute for Advanced Studies. Co-author with Tom Spencer (Cambridge) of Physical Geography and Global Environmental Change (Adison Wesley Longman)

PHOTO: DARIN DUECK

A world-wide sustainability transition is intended to enhance human prosperity, protect the Earth's life-support systems and reduce hunger and poverty. To what extent are we approaching this goal in the area of water resources (question 1) and is it even useful to address this question by sector (question 2)?

The total amount of freshwater available for human use is not at issue: more than one billion cubic kilometres of freshwater are found at and close to the Earth's surface. Least of all in Canada is this a problem, where half of one percent of the global population has access to 9 per cent of global surface freshwater. But the distribution of surface freshwater

(distant from many urban centres) and the timing of precipitation (least during seasons of greatest agricultural, industrial and domestic demand) present challenges to human ingenuity.

Groundwater, on which 25 per cent of Canadians are dependent, is increasingly threatened by pollution from inappropriate land uses. More serious is the fact that Canadians use more water per capita than any other nation except the United States (over 600 litres per capita per day for all uses on average). Immediate improvements would not be painful to make given that Canadian households with metered water use consume less than 300 litres per capita per day for

domestic purposes, whereas those paying a flat rate for water consume over 400 litres per capita per day for the same purposes. However, the political will to implement such simple improvements remains weak.

It has been pointed out numerous times that inadequate access to and inappropriate management of freshwater resources are leading to a wide range of ecological and human crises. Human populations continue to grow, wetlands are experiencing severe reduction, land use changes that favour urban development are intensifying, and tropical rainforests continue to be logged at unsustainable rates. If the global climatic changes that are well documented continue to

move in the direction of greater warmth and aridity then water related illnesses and regional conflicts over scarce shared watersupplies can be expected to accelerate.

The answer to the first question is therefore that Canadians in particular, and humanity in general, are not making good progress towards achievement of sustainable water resources. Criteria that are increasingly being considered and which represent positive signs in this discouraging scenario include: (1) an agreed principle of guaranteed access to a basic amount of water necessary to maintain human health and to sustain ecosystems; (2) basic protections for the renewability of water

resources, and; (3) institutional recommendations for planning, management and conflict resolution.

The answer to the second question is that freshwater resources intersect with so many human activities that it is at least a questionable strategy to attempt to deal with the issue sectorally. Whether we look at so-called in-stream uses of freshwater, such as hydro-electric power production, shipping, recreation or fish habitat, or so-called withdrawal uses such as domestic, industrial, irrigation, livestock watering and thermal plant cooling, freshwater resources must surely be managed in conjunction with holistic policies directed towards realization of a worldwide sustainability transition. □

Growing a New Generation of Green Buildings BY BRIAN LIN



PHOTO: MARTIN DEE

Trees aren't the only things sprouting up green at UBC these days. Walk into one of the newer buildings, and you're likely to encounter a range of environmentally friendly features.

The first two green buildings — the C.K. Choi Building for the Institute of Asian Research and the

Li Institute for Global Studies — were constructed in the late 1990s. They have won five international awards, including a listing on the American Institute of Architects' Top Ten Earth Day 2000 Green Buildings, for features such as natural ventilation, recycled building materials and composting toilets.

More recently, the Fred Kaiser Building, which opened in September 2005 and houses the Dept. of Electrical and Computer Science, was lauded for its use of solar-protectant ceramic window coating to conserve energy while maximizing natural lighting. Designed to be a "living laboratory" for engineering students, the facility's skylights are lined with photo-

voltaic cells to store solar power for emergency lighting and serves as an educational tool for electrical engineering students. The Life Sciences Centre (LSC) made history this January when it was awarded the prestigious Leadership in Energy and Environmental Design (LEED®)

tributes to an annual saving of 6.4 million kWh of electricity and nearly \$200,000 in energy costs.

Over at the Great Northern Way Campus (GNWC), the Centre for Interactive Research on Sustainability (CIRS) is set to begin construction this spring. Designed with 3D virtual software, CIRS will

"As far as sustainability is concerned, no other community in North America is aiming for such high standards."

Gold certification by the United States Green Building Council for its innovative sustainability features. The largest building at UBC, the LSC is only the second facility that houses research laboratories in Canada to receive the environmentally-friendly seal of approval. Only four other buildings in the province and seven others in Canada have reached this rating.

Compared to standard buildings, the LSC emits 1,000 tonnes fewer greenhouse gases annually, consumes 28 per cent less energy and 50 per cent less water. A dynamic monitoring system, which adjusts interior lighting and ventilation according to the external environment, con-

incorporate cutting-edge sustainability features, including oxygenated environments and remote-source lighting technology, invented by Lorne Whitehead, UBC Vice-President, Academic. UBC's newest campus in Kelowna, B.C., is also poised to make major innovations. Groundwater geo-exchange technology, where groundwater will be used to heat and cool \$400 million worth of new buildings planned for the UBC Okanagan campus, will be replacing an existing natural gas plant, which is nearing the end of its lifespan.

It is estimated that the new system will prevent 38,000 tonnes of car-

continued on page 10

The C.K. Choi building is the first green building at UBC.

Courses Examine Food Systems Close to Home

BY ART BOMKE,
Associate Professor, and

ALEJANDRO ROJAS,
Senior Instructor,
Faculty of Land and Food Systems



PHOTO: MARTIN DEE

The global food system that currently serves UBC and its region has delivered large volumes of low-cost food, but is also implicated in the health issues that flow from over and under-consumption and faces many challenges to its sustainability. Not the least of these challenges are the costs of long distance transportation of food and the separation of the vast majority of people from the sources of their sustenance.

Food security and sustainable food systems have become central concerns in the Faculty of Land and Food Systems (FLFS, formerly Agricultural Sciences), at UBC. This is the result of our Faculty's transformation to a more explicit focus on "human health, a



PHOTO: DARIN DUECK

Prof. Bomke (above) and Senior Instructor Rojas (left) have made UBC itself into a living lab to study food systems.

sustainable food supply and the responsible use of finite land and water resources using student-centred learning and interdisciplinary perspectives." Instructors and students in the FLFS Land, Food and Community core curriculum have mounted two initiatives, The Food Security Project in the City of Vancouver and the UBC Food System Project, aimed at providing our students with a solid understanding of the ecological, social and economic sustainability of food systems.

The Collaborative Project on Food Security in the City of Vancouver

This Community-Based Action Research Project explores approaches for reconnecting food, human health and environmental health to improve food security and, secondly and more specifically,

by contributing to the City of Vancouver's efforts to enhance food security and sustainability.

This project involves collaboration with the adjacent community, the Vancouver School Board and the City of Vancouver to share and produce knowledge about the existing situation and devise and implement action plans for transition to greater food security and food system sustainability.

The UBC Food System Project

The initial idea for this course was to link the Faculty's curriculum with the UBC Farm on the UBC South Campus. However, the teaching team's original idea evolved to recognize the UBC Farm as one thread of a larger tapestry: the UBC food system. Thus, the central theme of the course became the problem of the overall sustainability of the UBC food system.

We saw the UBC food system as a microcosm of, and interrelated to, the global food system. Given its area and rapidly increasing population, we felt that assessments of the sustainability of the UBC Vancouver campus and its evolving "University Town" development must include consideration of how the "Town" will be fed and how this can inform its land use and institutional food system.

The UBC Food Security Project is the first project at a university in Canada to come up with sustainability principles and to connect students with the major stakeholders — the departments and people who manage the food, the campus farm, and the waste at the university. Besides the team from the FLFS, and the UBC Campus Sustainability Office's SEEDS Program, initiators of the UBC Food System Project, the other

partners in the project are UBC Food Services, the Alma Mater Society's Food & Beverages Department, UBC Farm (Centre for Sustainable Food Systems), UBC Waste Management, UBC Campus and Community Planning.

Both the Collaborative Project on Food Security in Vancouver and the UBC Food Security Project are intended to connect our students and instructors' teaching and learning objectives with the immediate environment and the people of the region. UBC and British Columbia, in general, are in an era of unprecedented growth and facing challenges to the sustainability of our agriculture and human settlements. The core values of our Faculty demand that we connect ourselves and our students with the nutrition and health of our population and the sustainability of our campus and community food systems. □

Air Pollution *The price for our way of life*

BY DOUW STEYN,
Professor, Department of Earth
and Ocean Sciences, and

MICHAEL BRAUER,
Professor, School of Occupational
and Environmental Hygiene

When most of us think of air pollution, images of factories belching smoke or vehicles leaving behind a cloud of soot often come to mind. Such conditions led to historical episodes of deadly air pollution — the most notorious being the great London smog in December of 1952 when there were

and cars produce far less pollution than even 30 years ago and air quality in many cities throughout world (including Vancouver) has improved dramatically. This success has occurred primarily in cities in Western Europe and North America, and is exemplified by the introduction of smokeless fuels for space heating and the removal of lead as an anti-knock agent in motor vehicle fuels. These examples show that appropriate legislation and management initiatives combined with new technologies and population education can have dramatic effects.

Yet all is not well. Today, half of the world's population, primarily the

source of greenhouse gas emissions contributing to climate change. There are many current initiatives to mitigate this problem but they have only scratched the surface given the huge numbers of people involved.

Many decades of research have led to huge advances in our

Our "just-in-time delivery" economy and sprawling cities result in more localized truck traffic and its carcinogenic diesel exhaust.

approximately 12,000 excess deaths resulting from a 5-day period of intense air pollution. With growing worldwide industrialization, emissions have increased and become more widespread. The introduction of more complex fuels, and combustion occurring in a wider range of conditions, has led to growing toxicity of emissions, and increasingly evident effects on ecosystems.

Modern power plants, factories

rural poor of developing countries, still cooks over open fires. The resulting smoke exposure leaves non-smoking women with lung disease typical of smokers and is a major contributor to infant pneumonia — the number one cause of infant mortality in the world. The World Health Organization estimates that such air pollution is responsible for 2 million deaths per year. This inefficient burning of fuel is also a major

understanding of meteorological, and chemical factors underlying the formation of air pollution and the complexities involved in its fate and impacts on humans and ecosystems. This understanding has made it clear that our activities and lifestyle contribute to costly air pollution locally, regionally and globally. Living close to one of the many roads in our



PHOTO: DARIN DUECK

Prof. Douw Steyn says his research is driven by an interest in the polluted atmosphere.

cities results in increased risks for numerous respiratory and cardiovascular diseases.

For the convenience afforded by the car, we pay by emitting fine particles in our neighbourhoods and producing precursors that form

ozone which damages cash crops, stunts the growth of our trees and affects human lungs hundreds of kilometres downwind.

Our "just-in-time delivery" economy and sprawling cities result *continued on page 11*

A Matter of Inter-Generational Justice

BY PAUL WOOD Associate Professor, Faculty of Forestry

Sustainability primarily refers to the human use of the natural environment, and implies that we should sustain...something. And for some length of time. Well, should we?

The answer, of course, depends on what we ought to sustain and for how long, and it is precisely these contentious issues of content and duration that frustrate the definition of the concept of sustainability. Also, who should do the sustaining, for whom, and why?

These are ethical issues. They are not scientific issues, although science is indispensable for suggesting how we might sustain, and for predicting the consequences of failing to do so. Instead, these are fundamental issues about how we should or ought to treat others by way of the natural environment. They are issues about interpersonal, international, and intergenerational justice; about how we ought to distribute natural resources spatially and temporally. Some would include interspecies justice. In turn, rationality, not personal opinion, is the foundation of principles of justice.

Take intergenerational justice, for example. It is not rational that one generation should get more of what it wants than others if the only distinguishing feature of the lucky generation is its prior existence in time. That distinction is arbitrary, and rationality abhors arbitrariness. Intergenerational injustice is simply raw, irrational discrimination.

So who should sustain what, for how long, and for whom? At a minimum, we ought to practice intergenerational justice, which in turn implies conserving enough of the natural environment to ensure that future generations will have the same opportunities in life that we have. Recent work on sustainability of forests, fisheries, agriculture, and other resource sectors has given us some clear insight into what we ought to do. For example, we know that we have to give fish populations time to rebuild themselves; the world's fisheries are largely depleted from massive overharvesting. And we know that we have to learn to live without further destroying species' habitats; we are now losing

species at a rate unprecedented since the demise of the dinosaurs 65 million years ago.

At the same time, three ethical issues are impeding our ability to sustain. First, some still believe in the 'techno-fix,' that humans are sufficiently ingenious to find substitutes for any resource that becomes too scarce. Admittedly, humans are innovative, and to some small extent we can substitute one resource for another.

But the human-caused rate of change to the Earth is so large and rapid — to the point of affecting major life-support systems — that it is unlikely that future generations will be able to substitute for the damage we are doing. The preceding article by Professor Rees speaks to this issue.

Second, since we cannot know exactly what future generations will want, some people would like to dismiss the idea that we carry any obligations to those who will follow us. This is a non sequitur. We do not know the specific preferences of future generations, but we do know they will want all-purpose goods such as biological resources and tolerable environmental conditions. Yet it is precisely these conditions, including the environmental condition known as 'biodiversity' (the source of biological resources), that the present generation is degrading so rapidly.

Finally, the political structure of Western nations caters to the short-term preferences of the current electorate for a straight-forward reason: voters authorize liberal democratic governments to act only in their best interests (in theory). Sustainability strongly implies that Western nations — the most rapacious consumers of the world's resources — constrain their rates of consumption for the sake of future generations (not to mention most currently living people). But these governments cannot act in the interests of future generations unless the current electorate authorizes them to do so. And we do not; not by a long shot.

The one thing we should not sustain, therefore, is our current way of thinking. □

At a minimum, says Prof. Wood, we ought to conserve enough of the natural environment to ensure future generations will have the same opportunities that we have.



PHOTO: DARIN DUECK

UBC a Test Site on Hydrogen Highway

continued from page 1

Canada — to test and showcase the efficiency of hydrogen fuel cells.

"Our role in the project is to integrate fuel cell technology into our plans for a sustainable campus," says Jorge Marques, CSO energy manager. "We want to explore community-oriented applications for hydrogen technology."

Hydrogen fuel cells are electrochemical devices that generate electricity without combustion by combining hydrogen and oxygen to produce water and heat. Their primary advantage is that, unlike internal combustion engines, they create little air pollution, greenhouse gases, noise, or vibration, and operate at high efficiencies over a wide range of loads. In addition, hydrogen can be produced anywhere in the world.

"We want the UBC community to experience concepts they may have only read about or seen on TV," says Irfan Rehmanji, project co-ordinator for the UBC node. "The node will integrate a number of concepts that affect our daily life and will be a phenomenal outreach and social marketing tool."

The university plans to participate with Vancouver's Westport Innovation to convert a heavy-duty vehicle to a diesel-hydrogen hybrid engine. Another initiative involves a new patrol vehicle for Campus Security that uses a hybrid fuel cell drive train, designed by Lower Mainland companies Dynasty Motors and Delta-Q technologies. The fuel cell will be supplied by Vancouver-based Ballard Power Systems.

Micro fuel cells, supplied by Vancouver-based partner Angstrom Power, will be used to power lights for bikes or bike helmets, to explore how the cells can be used for small-scale applications. Some UBC walkie-talkies and 10-20 cell phones will also be retrofitted with hydrogen fuel cell units.

In addition, UBC will work with TransLink, the Greater Vancouver Transportation Authority, to run a fuel cell-operated 36-passenger community shuttle bus on the Vancouver campus area.

There are three major fuel cell demonstration projects in Canada, says Alison Grigg, manager of the

BC Hydrogen Highway™ Project. In addition to the highway, there is the Vancouver Fuel Cell Vehicle project and Hydrogen Village in Toronto.

"B.C. is leading the way in hydrogen fuel cell technology, with delegates from around the world coming to look at what we're doing," says Grigg. "UBC is a logical development and demonstration site because of its vision for a sustainable campus and its leadership in sustainability practices and research."

Hydrogen does not exist by itself in nature — it must be produced and compressed to be useful. It can be extracted from substances such as natural gas or other fossil fuels, or from methane gas produced at landfills or hog farms. Hydrogen can also be produced using solar or other renewable electricity, such as that derived from water that is electrolyzed from having an electric current run through it.

The NRC Institute for Fuel Cell Innovation on campus currently operates a hydrogen fuelling station, which will be used for the UBC



demonstration projects. Creating and storing hydrogen economically is one of the challenges of the hydrogen economy, and has led environmentalist David Suzuki to query if the hydrogen economy is hope or just hype.

He wrote in *Science Matters* in May 2004 that "to be pollution-free, hydrogen must be made using renewable energy, such as solar or wind. Otherwise, we will simply shift the pollution source from our vehicle tailpipes to smokestacks at hydrogen-production plants."

Sources of hydrogen are being uncovered all the time, says Grigg, who is confident that sufficient and sustainable supplies can ultimately be

made available.

Final funding approval for UBC's projects is expected this month.

The Hydrogen Highway™ is supported by several Government of Canada organizations that include Natural Resources Canada, Industry Canada, Hydrogen Early Adopters Program, Sustainable Development Technology Canada and Fuel Cells Canada, a private, not-for-profit industry association based at UBC.

For more information on fuel cells, visit www.fuelcellscanada.ca. □

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Beating the Kyoto Targets

*How a community of
50,000 is learning to
tread more lightly
on the earth.*

BY LORRAINE CHAN

In 1997, UBC was the first Canadian university to adopt a sustainability development policy. In 1998, UBC opened the Campus Sustainability Office (CSO) — the first of its kind, as well.

Eight years later, student, faculty and staff efforts are seeing results. They have helped UBC's Vancouver campus surpass Canada's 2012 Kyoto Protocol targets, having reduced over the past 16 years greenhouse gas emissions by 25 per cent. And last year, UBC was Canada's first and only university to receive Green Campus Recognition from the U.S.-based National Wildlife Federation.

How does a campus community of 50,000 organize itself to tread more lightly on the earth? CSO Director Freda Pagani says the secret lies in making it easy for students, staff and faculty to do good.

"People emotionally are ready to do something, but don't know what," says Pagani, who has steered CSO from the start. "Our role is to say here's an easy thing you can do and it's fun."

Since 1999, despite a 24 per cent increase in students, UBC has reduced energy use in campus buildings by 10 per cent — saving \$8 million. As well, UBC has cut down on water use by 32 per cent, enough to supply 14,700 homes for a year.

Since 1997, UBC has seen transit ridership increase by 140 per cent — now at more than 50,000 daily users — and single-occupant vehicle traffic decrease by 18 per cent per capita. This has been largely through initiatives like U-Pass that provides all



People are emotionally ready to do good; just make it easy for them, advises Freda Pagani, director, Campus Sustainability Office.

At that time, Pagani was working at UBC's project development office. She decided that her next building project would demonstrate a green building. Pagani worked with a team of 30 architects, engineers, designers, administrators, who were told to dream big, but to bring the C.K.Choi Building in on budget and

will develop eight residential and mixed-use neighborhoods featuring student, faculty and staff housing, university-related shops and services, a community centre, a school and a range of public amenities. The plan stipulates that at least 50 per cent of households must include one resident who works or studies at UBC, with

Since 1999, despite a 24 per cent increase in students, UBC has reduced energy use in campus buildings by 10 per cent — saving \$8 million. As well, UBC has cut down on water use by 32 per cent, enough to supply 14,700 homes for a year.

students with an affordable monthly transit pass and unlimited access to Translink bus, SeaBus and SkyTrain services. The U-Pass first became available in 2003 when UBC's transportation planning department, formally known as TREK, partnered with the Alma Mater Society and TransLink.

Pagani, who holds a PhD in Resource Management and Environmental Studies, says the mindset of sustainability requires a radical shift in thinking, one that she sees happening at UBC. Her own turning point came in spearheading the concept of UBC's C.K. Choi Building, which, upon its opening in 1996, won several awards and set new green benchmarks for the world.

"I was pretty depressed about the world and I was doing my bit to reuse plastic bags and turn off lights, but it didn't feel like I was making enough of an impact."

on time.

"That experience changed my life," says Pagani. "At the end, everyone said that was the best project they've ever been in. Mostly because everyone felt we had given them permission to be creative, to be imaginative and to make a difference."

Pagani was told that she would have to fund her own salary and CSO activities through energy savings. She devised *ecotrek*, one of the largest institutional retrofits in Canada. In 2002, UBC kicked off the \$35-million-dollar program to save money and energy by upgrading mechanical and electrical systems in core campus buildings. By this year, *ecotrek* will reduce CO2 emissions by about 15,000 tonnes each year and generate annual savings of about \$2.5 million.

By 2010, UBC aims to have another 20,000 people living on campus. The University Town Plan

an eye to reducing automobile traffic to and from campus.

Pagani says that UBC has adopted a five-year sustainability action plan to build on this momentum. Goals include integrating sustainability issues into research, teaching and curriculum.

But at the heart of all these efforts, says Pagani, is a deeper shift that's slowly taking shape.

"We've made a good start with economic and environmental sustainability, but we're still learning about community and how to treat each other."

That aspect of sustainability will transform everything we do and think, says Pagani. "Connection is the key — our connection to each other and to the natural world."

For more information about UBC's sustainability initiatives, visit: <http://www.sustain.ubc.ca/> <http://www.recycle.ubc.ca/> <http://www.trek.ubc.ca/> □

How Water Works in a Valley continued from page 4

"So they had to abandon that activity," says Wagner.

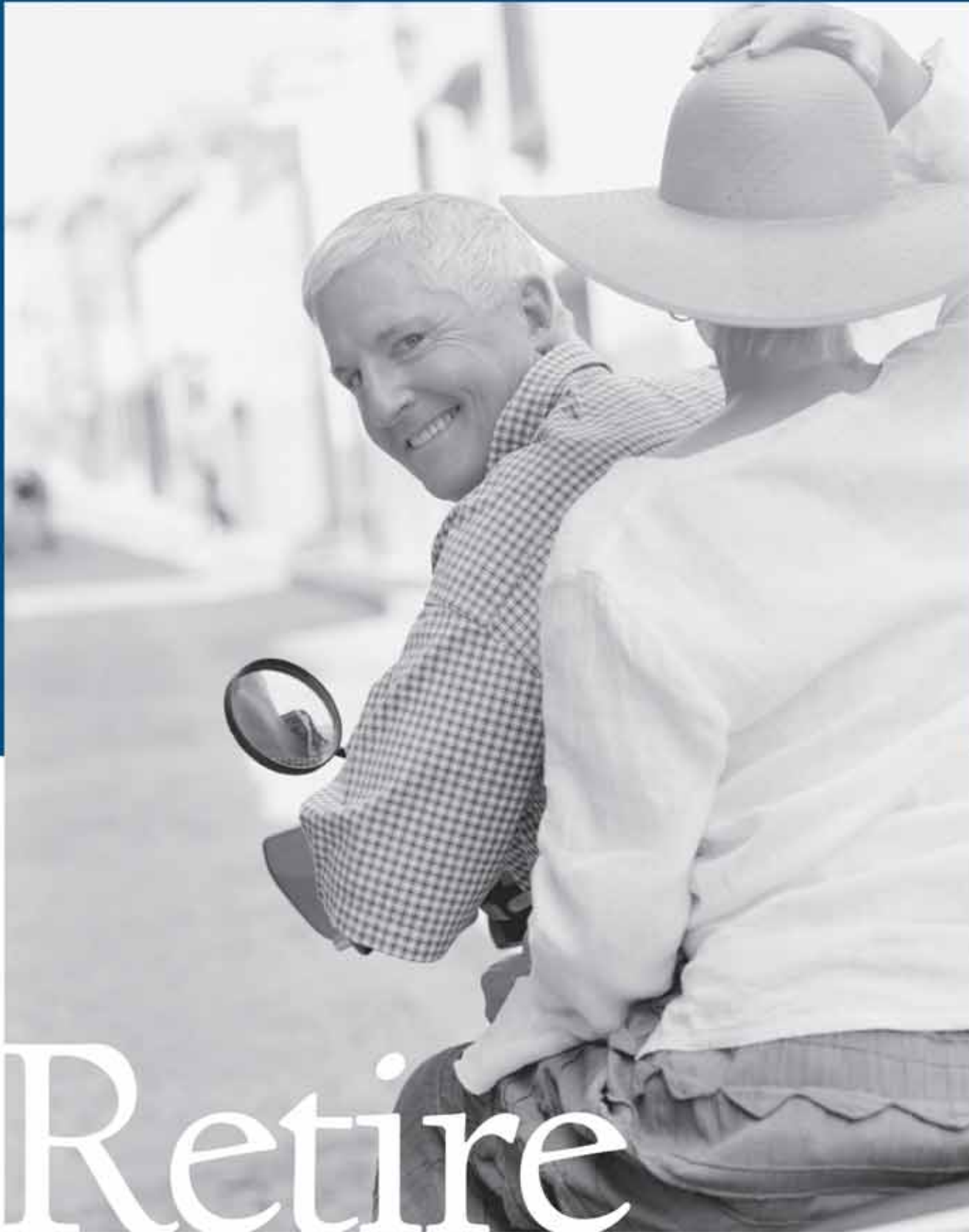
In collaboration with the En'owkin Centre, an Indigenous cultural, educational and creative arts institution in Pentiction, and the Pentiction Indian Band, he has previously interviewed elders from that community and will soon be interviewing orchardists and ranchers from other communities in

the Pentiction area. "We want people to describe the changes they've seen in water use during their lifetimes," he says.

It is a big project, but ultimately Wagner hopes to be able to share his findings with water managers, guiding tomorrow's stewardship of a precious and limited natural resource. To that end he will also be studying the operation of water man-

agement organizations in the valley.

"There are a lot of institutions in the Okanagan with authority over water and water quality, but they're not co-ordinated," says Wagner. "The hope is that by studying the institutional structure of water management organizations here we will be able to find ways to manage water in a more sustainable and equitable manner." □



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Footprints to Sustainability continued from page 1

Eco-footprinting thus starts from a series of simple premises:

- People remain integral components of the ecosystems that sustain them;
- Most human impacts on ecosystems are associated with energy and material extraction and consumption (all economic activity has material consequences);
- Many energy and material flows are readily measurable and can be converted to corresponding productive or assimilative ecosystems areas;
- There is a finite area of productive land and water ecosystems on Earth.

From this perspective, every human population imposes an ecological 'load' or 'footprint' on Earth measured in terms of sustained demand for bio-productivity. We therefore define the ecological footprint of a specified population as *the area of land and water ecosystems required, on a continuous basis, to produce the resources that the population consumes, and to assimilate (some of) the wastes that the population produces, wherever on Earth the relevant land/water is located.* Per capita eco-footprints can be estimated by dividing aggregate national footprint by the total population.

What does EFA tell us that might be relevant to prospects for global sustainability? For starters:

- Energy/material consumption remains highly correlated with rising GDP/income per capita;
- The average eco-footprints of high-income countries range from about 4.5 to almost ten hectares of global average productivity per capita (ha/cap); those of developing countries are as small as 0.5 ha/cap;
- Many high-income countries have eco-footprints up to several times the size of their domestic bio-capacities;

- The average human eco-footprint is about 2.2 ha/cap;
- There are only about 1.8 ha/cap significantly productive land and water on Earth.

These five key findings alone suggest that the sustainability challenge is greater than the world community has heretofore been willing to concede. First, the denizens of wealthy market economies like the US, Canada, most Western European countries and Japan appropriate two to five times their equitable share of earth's bio-capacity while those of low-income countries like Bangladesh, Mozambique and even China, use only a fraction of their equitable allocation.

Second, many wealthy consumer societies have greatly overshoot their domestic carrying capacities and are running large eco-deficits with the rest of the world. These countries would have long since stabilized or imploded in the absence of trade. As expected, trade sustains short-term growth and short-circuits the negative feedback from degraded ecosystems that would otherwise serve to warn countries that they are approaching local biophysical limits. In effect, the world's rich nations finance their ecological deficits by extending their ecological footprints deeply into exporting nations and the open ecosphere. (We now achieve through commerce what used to require territorial occupation!) The downside is that by shuffling bio-capacity around, trade ensures that the entire human family will hit global limits simultaneously.

Third is an obvious ecological corollary — not all countries can run an eco-deficit. For every sustainable deficit there must be a permanent surplus somewhere else and there are no true surpluses. The aggregate world population has already overshoot global carrying capacity by about 20 per cent (The direct empirical evidence is accelerat-

ing global degradation).

Fourth, on an ecologically full planet, the less-developed countries cannot sustainably follow the developed world's path to material extravagance. If 1.2 billion people of China had the same per capita eco-footprint as citizens of the US, China *alone* would require the entire bio-capacity of Earth. (The US, with less than 5 per cent of the world's population, uses about a quarter of its resources.) To bring the present world population up to, say, North American material standards with prevailing technology would require four additional Earth-like planets! This poses a conundrum for growth-based sustainability. As someone once wryly observed, "good planets are hard to find." An ever-expanding global economy thus puts humanity on a collision course with ecological sustainability. Geo-political sustainability too — in a competitive world of climate change and increasing resource shortages, rising material expectations everywhere may become greatest threat to human security.

The challenge of EFA to sustainability is therefore really quite straightforward. We must learn to share Earth's bio-capacity more equitably. First-World countries should be implementing policy measures to reduce their per capita ecological footprints to 1.8 ha/capita to create the ecological space for needed growth in the Third World — and the reductions will have to deepen as world population grows. For wealthy consumer societies, this implies a 75 per cent reduction in material and energy consumption and poses an immense challenge both to technology and lifestyles. (Other energy/material flows studies argue for 90 per cent reductions). These numbers may seem politically impossible, but they are ecologically necessary for sustainability. Unfortunately, prevailing mainstream approaches merely makes the growing human enterprise more efficiently unsustainable. □



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New Generation of Green Buildings continued from page 5

bon dioxide emissions into the atmosphere over a 20-year period, the equivalent to taking 8,000 cars off the road, or planting 18,000 acres of fruit trees or vineyards.

In addition to these academic facility milestones, UBC's residential developments are also going "green."

"In just the past year, seven development projects on campus

new residential developments on campus, including the upcoming South Campus Neighbourhood, which will consist of nearly 2,000 homes.

"It ensures a basic level of energy and water efficiency and encourages developers to take additional steps to produce a more sustainable project," says Marques. "In one mid-sized development that is currently under

and as far away as Kelowna have noticed REAP's success and requested information to potentially adopt the program.

Meanwhile, Joe Redmond, vice-president of UBC Properties Trust, which co-developed REAP, says the University's commitment to sustainability goes far deeper than conscientious designs and energy-efficient buildings.

"In just the past year, seven development projects on campus have adopted the Residential Environmental Assessment Program (REAP)."

have adopted the Residential Environmental Assessment Program (REAP)," says Jorge Marques, energy manager of the UBC Sustainability Office.

Launched in November 2004, the made-in-UBC pilot program is the residential equivalent of LEED®, which is awarded to leading-edge buildings that incorporate environmentally sustainable design, construction, and operational features to reduce environmental impact. During its pilot year, housing developers were encouraged to voluntarily comply — and exceed — sustainability principles already being applied to their institutional counterparts.

REAP is now mandatory for all

construction, the home owners will collectively save over \$11,500 in energy costs per year as a direct result of using this program."

While LEED®, used for institutional buildings and high-rises, can be costly and time-consuming, REAP takes a market-driven approach to attracting developers to adopt sustainability initiatives, says Marques.

"It was never meant to be outrageously costly or onerous. We simply offer developers principles that are good for the environment and ultimately healthier for the residents."

Neighbouring municipalities including North Vancouver, Burnaby

"In both the UBC Official and Comprehensive Community Plans, concrete goals were set to transform us from a commuter campus to a university town where 25 per cent of the students live here and 50 per cent of campus housing will have at least one resident studying or working at UBC," says Redmond.

"The decrease in fossil fuel consumption and greenhouse gas emission from that policy alone will far exceed energy efficiency savings of any green building. The impact will be tremendous."

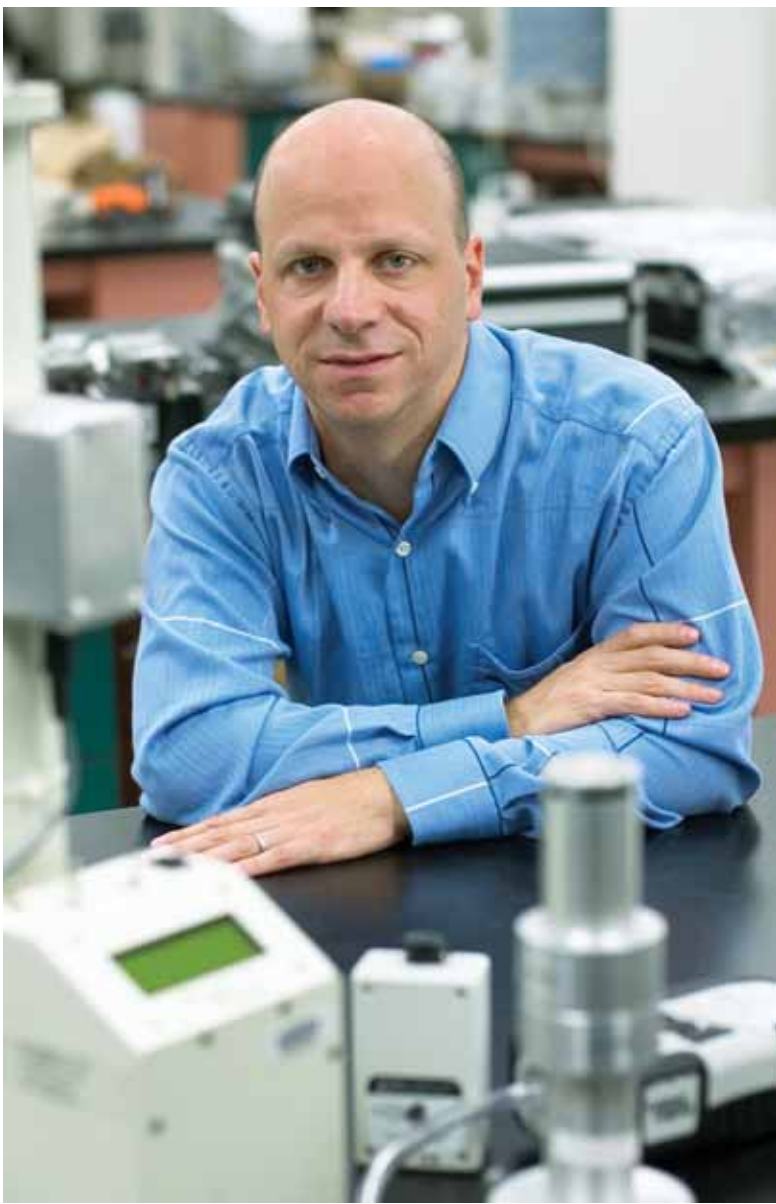
"As far as sustainability is concerned, no other community in North America is aiming for such high standards." □

Air Pollution

continued from page 6

in more localized truck traffic and its carcinogenic diesel exhaust. Our thirst for inexpensive consumer products leading to increased emissions from Chinese factories and the container vessels traversing the world and idling in ports has both local and global implications. Since the most severe impacts are felt in the growing economies of Asia — where air pollution in urban areas leads to hundreds of thousands of deaths per year — our purchases are linked to global health inequity. Further, the west coasts of Europe and North America now receive measurable quantities of air pollutants from across the Atlantic and Pacific oceans respectively. This is evidence that the entire lower atmosphere in the Northern Hemisphere is becoming increasingly polluted, even in “pristine” oceanic areas.

So, if we are the problem, then we must work towards solutions. These solutions depend on emissions reductions through technological advances such as fuel cells, and also the use of solar, wind and other alternative energy sources. Technological advances alone are unlikely to be sufficient — changes in land use and urban structure and transportation will be needed. But most importantly we must realize that it is our lifestyle and all of its conveniences that ultimately must be the key to sustainable air quality. □



Prof. Michael Brauer's research interests include air pollution health effects and air quality.

PHOTO: MARTIN DEE

KUDOS

Order of Canada

Three members of the UBC community — a renowned environmentalist, a leading expert in fisheries oceanography and an animal ethicist — were appointed to the Order of Canada by Governor General of Canada Michaëlle Jean on Feb. 3, 2006.

David Suzuki, professor emeritus of zoology, has been promoted within the Order to the rank of Companion. An award-winning scientist, environmentalist and broadcaster, Suzuki recently returned to the university as a speaker in the UBC Global Citizenship Seminar Series. (For an audio recording of his lecture, visit www.ubc.ca/podcasts.)

Appointed to the rank of Officer is oceanography Professor Emeritus **Timothy Parsons**. In 2001, Parsons became the first Canadian to win the prestigious Japan Prize — Japan's equivalent to the Nobel Prize — for his contributions to fisheries oceanography and marine conservation.

David Fraser, a professor in the Faculty of Land and Food Systems and the W. Maurice Young Centre for Applied Ethics, has been appointed to the rank of member. Fraser's work on animal welfare and ethics has led to many innovations in animal housing and management, ranging from designing better pig pens to reducing highway accidents involving wildlife.

Established in 1967, the Order of Canada is the highest honour that Canada can give its citizens for exceptional achievement, merit or service. These most recent appointments are effective Nov. 17, 2005. For more information, visit www.gg.ca/honours.

Stearie Fellowships

A UBC tree geneticist and a software engineer have each been awarded 2006 Natural Sciences and Engineering Research Council (NSERC) Stearie Fellowships — one of Canada's premier science and engineering prizes — earning UBC two of the six prizes awarded Canada-wide.

Joerg Bohlmann, an associate professor of Botany and Forest

Sciences, explores trees' chemical defense mechanisms against insects and other pathogens. Also a member of UBC's Michael Smith Laboratories and an associate of UBC's Wine Research Centre, Bohlmann's work could lead to new, environmentally safe methods for plant protection.

He is one of four co-directors of Canada's first large-scale forestry genome project. The \$15-million project involves sequencing the genome of poplar and spruce to identify the genetic blueprint that determines features such as wood quality and health, including defense mechanisms and resistance systems in forest trees.

Bohlmann, who joined UBC in 2000, has also been recognized as a UBC Distinguished University Scholar, a Peter Wall Institute Early Career Fellow and has received the Faculty of Science Achievement Award for Leadership.

Gail Murphy, an associate professor in the Dept. of Computer Science, has been recognized for her contributions to understanding and reducing problems associated with evolving large software systems.

Murphy's research involves looking at which system structures best support the expression, evaluation and verification of large software systems, and in helping software developers manage these structures. She looks at computer systems to find patterns of use so that software to detect developers' patterns of activity and assist that activity automatically.

Murphy, who joined UBC in 1996, is a recipient of a Dahl-Nygaard Junior Prize from the Association Internationale pour les Technologies Objets (AITO) a European association to promote the advancement of research in object-oriented technology, and a UBC Killam Research Fellowship.

NSERC Stearie Fellowships — comprising salary support and research funding — are awarded to outstanding Canadian university scientists or engineers, who have earned their doctorate within the last

12 years, and whose research has already earned them an international reputation. For more on the 2006 Stearie Fellowships, visit <http://www.nserc.gc.ca>.

UBC chemist wins Prestigious Killam Research Fellowship

On Feb. 28, 2006, UBC chemistry prof. **Michael Fryzuk** was awarded one of 10 new Canada Council for the Arts Killam Research Fellowships for his research work, “New Strategies for the Activation of Molecular Nitrogen.”

Among Canada's most distinguished research awards, the Killam Research Fellowships enable Canada's best scientists and scholars to devote two years to full-time research and writing.

Made possible by a bequest of Mrs. Dorothy J. Killam, the awards support scholars engaged in research projects of outstanding merit in the humanities, social sciences, natural sciences, health sciences, engineering and interdisciplinary studies within these fields. □

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PHOTO: MARTIN DEE

The largest structure in Canada certified Gold by the US Green Building Council is now on the University of British Columbia's Vancouver campus.



The Life Sciences Centre's LEED (Leadership in Environmental Design) Gold status reflects an extraordinary achievement in green building practices at The University of British Columbia. From recycled materials to ongoing energy savings, this home to BC's expanded medical education program and leading edge research institutes points the way to a more sustainable future.

Sustainability is a value deeply embedded in UBC's academic vision. After all, we're home to Prof. William Rees, internationally renowned for his Ecological Footprint tool, and more than 300 of our courses have high sustainability components. We have Canada's first Sustainability Policy for a university, first campus sustainability office, and we're the only Canadian university to gain Green Campus recognition from the US Wildlife Federation. We've already met 2012 Kyoto greenhouse gas reductions, and we've saved \$8 million in energy and water costs with innovative retrofits.

The Michael Smith Laboratories, named after UBC's Nobel Laureate, has achieved a 55 per cent energy reduction. Our Fred Kaiser Building has been certified LEED Silver. New buildings at our UBC Okanagan campus in Kelowna will be heated and cooled by geothermal energy.

The pattern of sustainability extends from where we study and work to where we live. Our emerging University Town in Vancouver is transforming a commuter campus into a more sustainable live-work-study community.

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